

Oct. 21, 1969

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3,473,205

FELTING APPARATUS AND METHOD

Filed Sept. 25, 1967

2 Sheets-Sheet 1

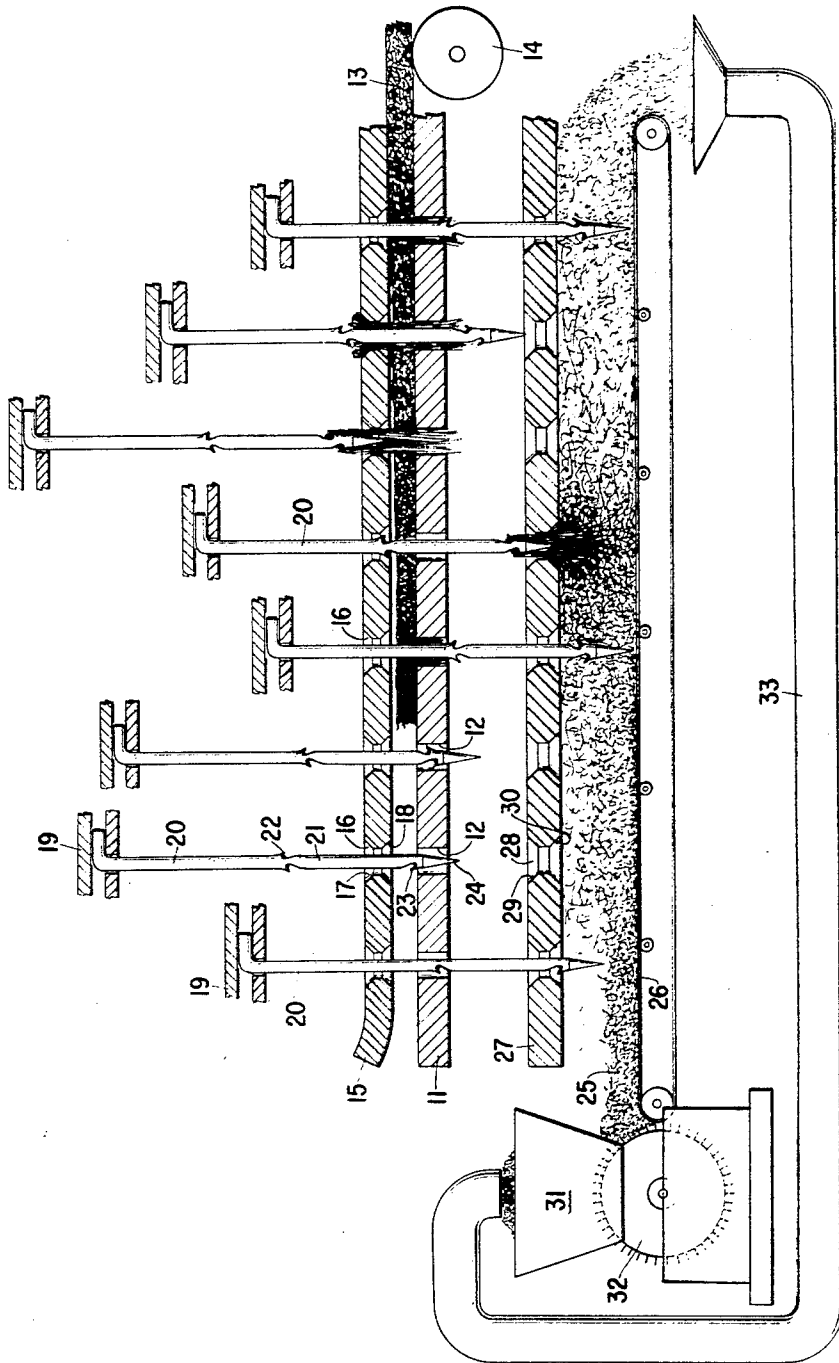


Fig. 1

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2 Sheets-Sheet 2

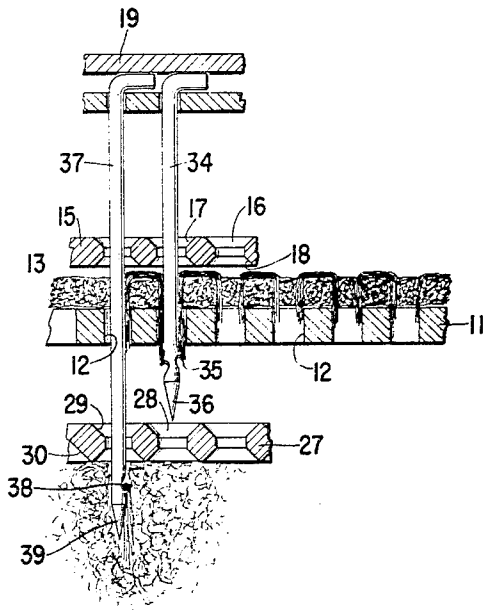


Fig. 2

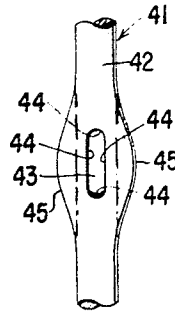


Fig. 3

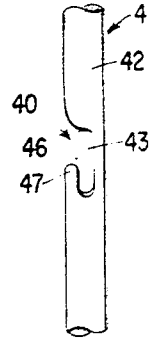


Fig. 4

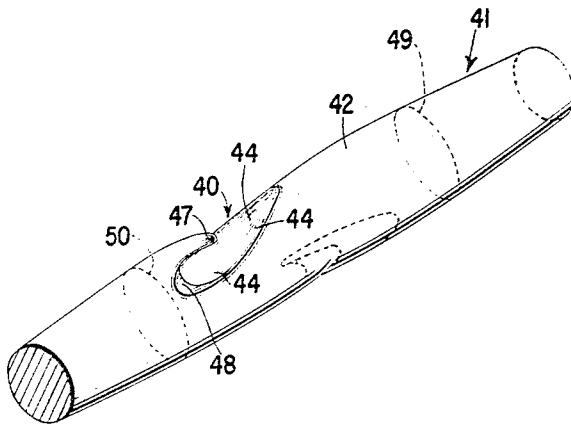


Fig. 5

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FELTING APPARATUS AND METHOD

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12 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure sets forth a method and apparatus which includes advancing a fiber material across a supporting surface; providing a source of additional or secondary fibers on one side of the supporting surface and projecting felting needles through the fiber material, and into the source of additional fibers to intertwine fibers in the fiber material and also to intertwine fibers from the additional source into the fiber material. Needles are provided having novel felting barbs formed by die pressing with at least the fiber engaging surfaces thereof being rounded. The novel apparatus and method disclosed herein provide for the efficient production of a needled fabric which can be patterned with fibers of different characteristics and includes means for drawing maximum amounts of fibers into the fabric with minimum fiber destruction.

SUMMARY OF THE INVENTION

This invention relates to method and apparatus for needling textile fabrics. The invention is generally carried out by providing a primary fiber material either in loose fiber form which is compacted through an initial needling step or in a web form which has been previously compacted. It should be understood that reference to a web of fiber material is intended to include a primary fiber material either in loose or compacted form. The web of fiber material is transported along a supporting surface where it is acted upon preferably by a series of felting needles. A source of secondary fibers is provided on one side of the supporting surface in the path of travel of the felting needles so that said felting needles will draw additional or secondary fibers from said source into the web of material. By means of the present invention, various effects can be provided in the web of material, such as color patterns, texture pile surface and the like by providing secondary fibers of different characteristics than the primary fiber material and/or by relatively moving the primary and secondary fibers during the needling operation. As will be also understood hereinafter through the novel construction of the felting needles of the felting apparatus, maximum fiber carrying capacity is provided with minimum fiber destruction so that the number of felting operations and needles is minimized. It should also be understood that by the term fibers it is intended to include, filaments, threads, yarns, etc. of natural or synthetic nature.

It is, therefore, an object of the invention to provide an improved felting apparatus and method whereby it is possible to produce a needled fabric of relatively great strength with a minimum number of operational steps.

Another object of the invention is to provide an improved apparatus and method in accordance with the foregoing object with which it is possible to produce unique patterns in the felted material.

A still further object of the invention is to provide an improved felting needle and method of manufacture

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whereby the cutting of fibers by the needle is greatly reduced.

Other objects and a fuller understanding of the invention can be had by referring to the description and claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a portion of a preferred embodiment of the felting apparatus with the needle board shown broken into segments in order to illustrate the needles in various portions;

FIG. 2 is a side elevational view of a portion of a modification of the felting apparatus of FIG. 1;

FIG. 3 is a plan view of a die pressed barb of a felting needle prior to final finishing;

FIG. 4 is a plan view of the barb of the felting needle of FIG. 3 after having been further processed to form the novel barb; and

FIG. 5 is a perspective view of a portion of a felting needle illustrating the novel die pressed barb.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings, a preferred embodiment of the invention is shown in part in FIG. 1. In FIG. 1 there is shown a fiber supporting surface in the form of a needle plate 11 having needle apertures 12. A web of fiber material 13 is advanced across the top of the needle plate by a power driven roll 14 or other suitable means. The web of fiber material can be a mat of fibers, loose fibers, or loose fibers on a backing fabric. For example, in the preferred embodiment, the fiber material is a mat of fibers. The fiber material is disposed between the needle plate 11 and a holding plate 15. The holding plate has needle apertures 16 in line with the needle apertures 12 in the needle plate 11. The needle apertures 16 in the holding plate 15 have upper and lower countersinks 17 and 18, respectively, for guiding the fibers. As will be apparent a suitable machine frame, not shown is provided for supporting the various elements described herein in a known manner.

Mounted above the web of fiber material in a needle board 19, in a known manner, are felting needles 20. The needle board is shown broken into segments in order to illustrate the needles in various positions. The needle board and hence the felting needles are disposed for projection through the web such as in FIG. 1 by reciprocation by conventional means which are also not shown. It is within the scope of the invention to mount needles above and/or below the fiber material. The needles preferably include a shank 21, upper barbs 22, lower barbs 23, and a point 24. In the first embodiment of the invention, the upper barbs point towards the needle point and the lower barbs point away from the point of the felting needle although not limited to this specific arrangement.

Beneath the needle plate is a source of secondary or additional fibers 25. The additional fibers are preferably moved relative to the needle plate by a conveyor belt 26. The additional fibers, as illustrated, are disposed between the conveyor belt 26 and a stripping plate 27. The stripping plate has needle apertures 28 in line with the needle apertures of the needle plate and the holding plate. As in the case of the holding plate, the needle apertures in the stripping plate have upper and lower countersinks 29 and 30, respectively, for guiding the fibers. The additional fibers are fed onto the conveyor belt from a card including a hopper 31 by means of a roll 32. The roll 32 is driven by conventional means which is not

shown. Additional fibers which traverse the conveyor belt without being used can be returned to the hopper by a suction conduit 33, or other suitable means such as a conveyor moving in a direction opposite to the conveyor 26 and oriented to deposit the fibers into the hopper 31. The secondary fibers 25 may be of different character than the fibers in the web 13, as for example, in color, texture weight, length, etc. The operation of the embodiment of FIG. 1 is further described hereinafter.

A modification of the invention is shown in FIG. 2. The modification of FIG. 2 differs from the first described embodiment only in the structure and arrangement of the felting needles. In the embodiment of FIG. 2, some of the felting needles 34 have barbs 35 which only point towards the points 36 of the needles while other needles 37 have barbs 38 which point only away from the points 39 of the needles. In addition, the latter needles 37 are preferably longer. It is within the scope of the invention, however, to use various combinations of the felting needles of the first and second embodiments of the invention and it is not intended that the invention be limited to the specific arrangement illustrated.

With particular reference to FIGS. 3 to 5, a barb 40 of a felting needle 41 is illustrated in various steps of its formation. As shown in FIG. 3, the shank 42 of the felting needle is die pressed to form an eye 43 having rounded peripheral surfaces 44. The rounded peripheral surfaces are formed by a die pressing operation. During the die pressing operation, lateral bulges 45 are formed in the shank of the needle due to the deformation of the material. To form the completed felting needle of FIG. 4, the lateral bulges are removed as by machining or the like and a slot 46 is preferably formed by pressing a die in communication with the eye 43 to produce the barb 40 having a point 47 along a portion of one side of the eye. The die pressing steps have the effect of forming rounded surfaces at all of the fiber engaging surfaces of the barb in a relatively simple operation without requiring substantial additional finishing steps to form these surfaces. As will be apparent, the lack of any sharp edges at these surfaces increases the efficiency of the needle by minimizing destruction of the fibers through cutting action which is an undesirable characteristic of needles not having rounded surfaces at these areas. It is within the scope of the invention to form the barb with its point inside, at, or outside the periphery of the shank of the felting needle. The portion 48 of the rounded peripheral surfaces 44 formed by the die pressing operation in the throat of the barb remains after the machining operation. As shown in FIG. 5, the shank 42 of the felting needle, which normally has a circular cross section 49, preferably has a partial elliptical cross section 50 in the region of the barb 40.

In operation, with particular reference to FIG. 1, the primary fiber material 13 is advanced across the needle plate 11 and the source of secondary additional fibers 25 is moved by the conveyor belt 26. Simultaneously, the felting needles 20 are reciprocated through the needle apertures 16 in the holding plate 15, through the fiber material, through the needle apertures 12 and 28 in the needle plate and the stripping plate, and into the supply of additional fibers. By the foregoing reciprocating movement, the felting needles intertwine fibers in the fiber material and also intertwine fibers from the additional supply into the fiber material. Both the barbs 22 which point toward the needle point 24 and the barbs 23 which point away from the point 24 of the felting needles intertwine fibers in the fiber material while the barbs 23 which point away from the points of the felting needles also bring up additional fibers 25 and intertwine them into the fiber material 13. Thus, a stronger felted material is obtained in less operational time and steps than was heretofore possible. In addition, unique patterns can be obtained as for example by using fibers of different character such as, one color for the fiber material 13 and a different color for the supply of additional fibers 25. Unique patterns can

also be obtained by using different combinations of needles. The countersinks in the needle apertures in the holding plate 15 and in the stripping plate 27 provide smooth non-interfering surfaces for guiding the fibers collected by the felting needles without causing cutting the fibers. The suction conduit or other suitable means recirculates fibers 25 which traverse the conveyor belt 26 without being used and, the felting needles formed from die pressed barbs having rounded peripheral surfaces greatly reduce the cutting and undesirable destruction of the fibers while providing for maximum yarn carrying capacity.

Although the invention has been described in its preferred embodiments with a certain degree of particularity, it is understood that the present disclosure of the preferred embodiments has been made by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention.

Having thus set forth the nature of this invention, what I claim herein is:

1. In a felting apparatus, a supporting surface for supporting a web of fiber material, a plurality of felting needles disposed for projection through said web of fiber material for compacting the fibers thereof, means for projecting said felting needles through said web of fiber material, and a source of additional fibers disposed on one side of said web of fiber material and in the path of travel of at least some of said felting needles such that during projection of said felting needles through said web of fiber material and into said source of additional fibers said felting needles will compact the fibers of said web of fiber material and draw additional fibers from said source of additional fibers into said web of fiber material.

2. In a felting apparatus as recited in claim 1 further comprising means for advancing said web of fiber material across said supporting surface and relative to said source of additional fibers.

3. In a felting apparatus as recited in claim 1 further comprising means for moving said source of additional fibers relative to said web of fiber material.

4. In a felting apparatus as recited in claim 1 wherein said felting needles are provided with at least two felting barbs on the peripheral surface thereof with one of said barbs facing in one direction relative to its intended path of travel and the other of said barbs facing in a direction opposite to said one barb.

5. In a felting apparatus as recited in claim 1 wherein said felting needles are each provided with a plurality of felting barbs on the peripheral surface thereof and the felting barbs on at least some of said felting needles facing in a direction opposite to the direction of the felting barbs on the other of said felting needles.

6. In a felting apparatus as recited in claim 1 wherein said felting needles are each provided with a plurality of barbs on the peripheral surface thereof and said barbs being die pressed into said felting needle and having all of the fiber engaging surfaces thereof rounded.

7. In a felting apparatus as recited in claim 1 wherein said source of additional fibers includes fibers of a different character from the fibers in said web of fiber material.

8. In a felting apparatus as recited in claim 1 further comprising a stripping plate disposed between said supporting surface and said source of additional fibers, said stripping plate having a plurality of apertures for receiving a felting needle therethrough and for guiding the fibers from said source of additional fibers when said felting needles draw additional fibers toward said web of fiber material.

9. A method of felting comprising disposing a web of fiber material on a supporting surface, furnishing a source of additional fibers adjacent to one side of said supporting surface, and projecting felting needles through the web of fiber material and into the source of additional fibers to intertwine the fibers in the web of fiber material and also drawing additional fibers from said supply of addi-

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tional fibers to intertwine fibers from the additional source into the web of fiber material.

10. A method of felting, as recited in claim 9 which includes moving the additional fibers relative to the supporting surface.

11. A method of felting as recited in claim 9 further comprising furnishing fibers of a different character for said additional source of fibers from the fibers of said web of fiber material.

12. A method of felting as recited in claim 9 further comprising, providing felting needles having oppositely directed felting barbs for drawing fibers into said fiber material from either side of said fiber material.

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